Figure 3.1 (left) A Scientist Injecting a Sample into a Mass Spectrometer. (right) Schematic Diagram of a Mass Spectrometer

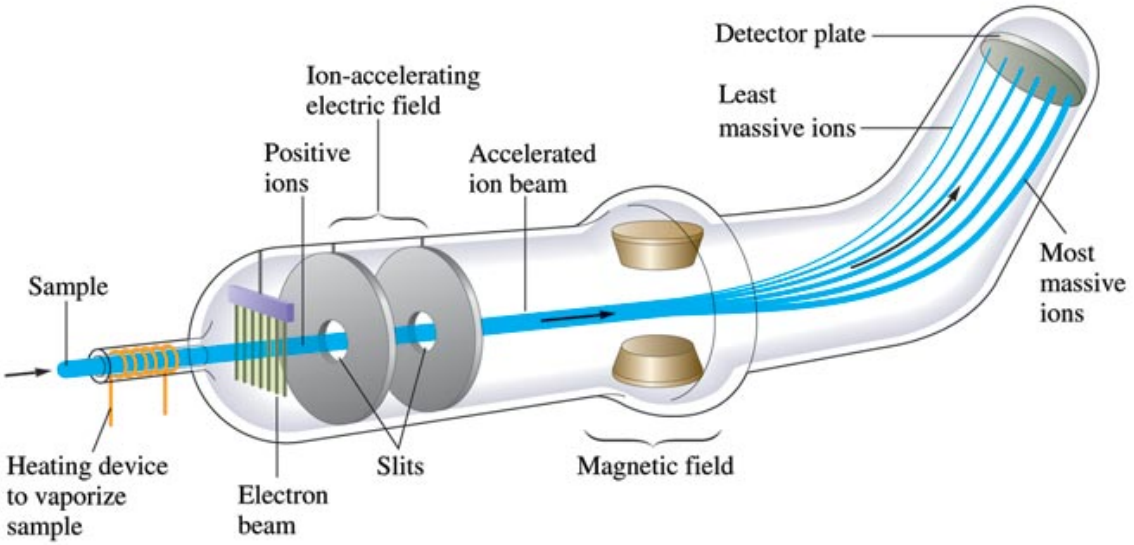


Figure 3.2b Peaks

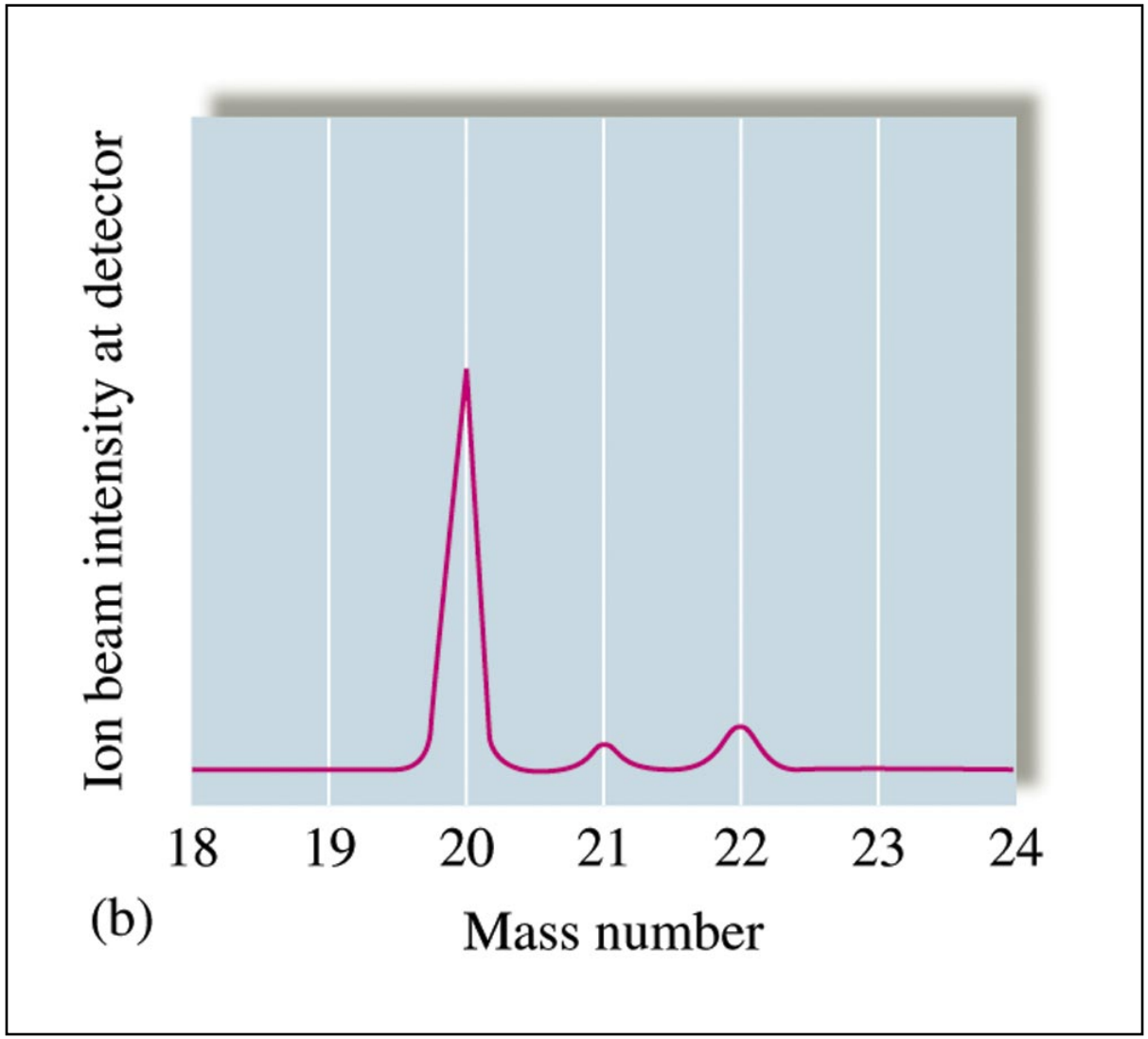


Figure 3.2c Bar Graph

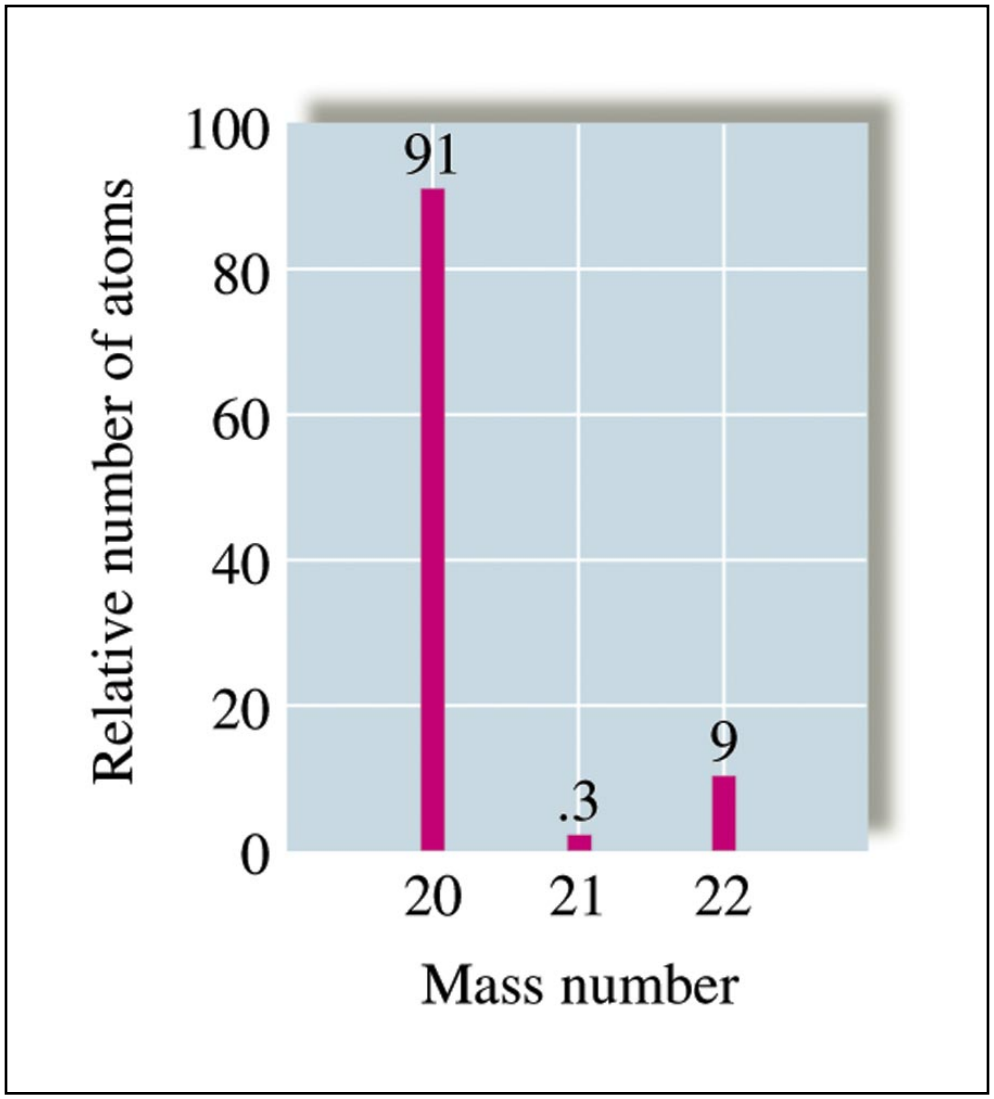
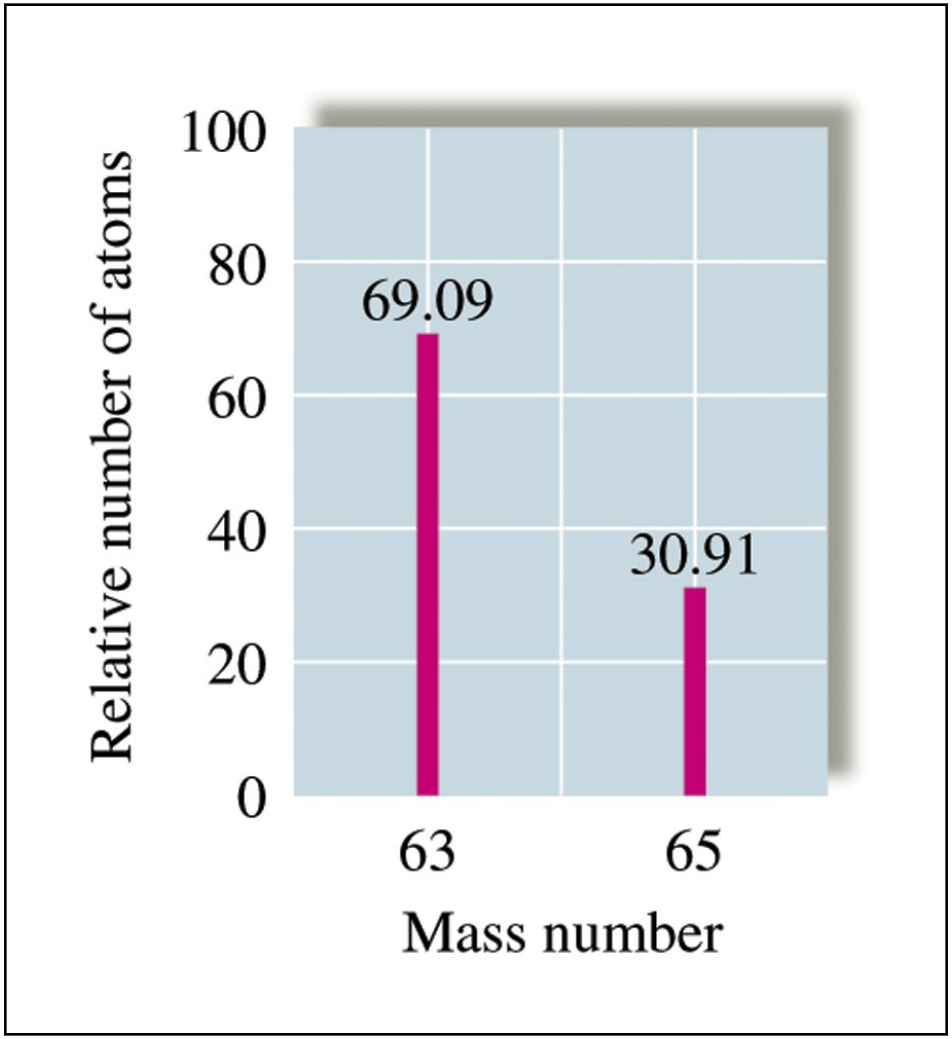


Figure 3.3 Mass Spectrum of Natural Copper



QUESTION

Suppose an element consisted of three naturally occurring isotopes. The reported average mass for the element was 75.42 amu. The following information is known: isotope I has a mass of 80.45 and makes up 2.4% of the element's atoms. Isotope II has a mass of 72.22 and makes up 30.0% of the element's atoms. What would you estimate as the mass of isotope III?

1. 74
2. 77
3. 67
4. I can't make estimates in my head!

QUESTION

Since atoms are so very small there will be a large number even in a small sample of an element. For example, if you just received 10 billion atoms of gold would this be better than winning a lottery prize? Prove by reporting the mass of gold.

1. The mass of gold would be 1970 grams.
2. The mass of gold would be 3×10^{-22} grams.
3. The mass of gold would be 1.7×10^{-17} grams.
4. The mass of gold would be 3.3×10^{-12} grams.

QUESTION

The fuel in small portable lighters is butane (C_4H_{10}). Suppose after using such a lighter for a few minutes (perhaps to encourage your favorite concert performer to play one more encore) you had used 1.0 gram of fuel. How many moles of butane would this be?

1. 58 moles
2. 0.077 moles
3. 1.7×10^{-24} moles
4. 0.017 moles

QUESTION

The compound Cr_2O_3 (chromium (III) oxide) is one of the key components responsible for the red color of ruby gems. If you had 34.8 grams of Cr_2O_3, how many grams of Chromium (atomic number = 24) metal would be present?

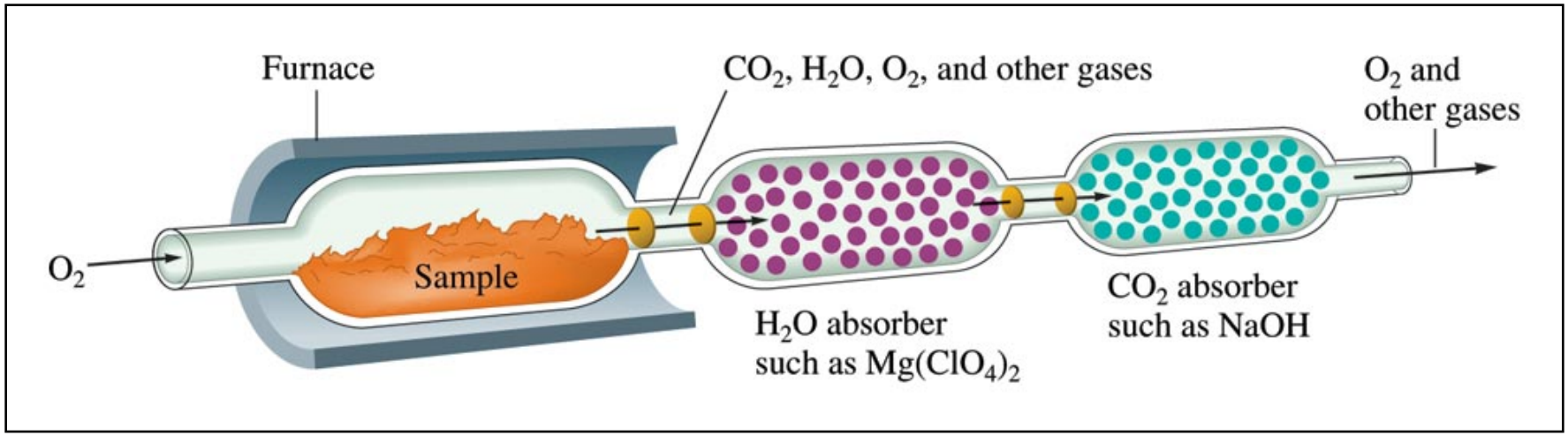
1. 11.9 grams of Cr
2. 5.85 grams of Cr
3. 23.8 grams of Cr
4. 69.8 grams of Cr

QUESTION

The dye indigo is a compound with tremendous economic importance (blue jeans wouldn't be blue without it.) Indigo's percent composition is: 73.27% C; 3.84% H; 10.68%N and 12.21% O. What is the empirical formula of indigo?

1. C_6H_4NO
2. C_8H_3NO
3. C_8H_5NO
4. I know this should be whole numbers for each atom, but I do not know how to accomplish that.

Figure 3.5 A Schematic Diagram of the Combustion Device Used to Analyze Substances for Carbon and Hydrogen



QUESTION

Formulas by combustion. A compound contains C, H, N. When 0.1156 g of this compound is reacted with oxygen, 0.1636 g of carbon dioxide and 0.1676 g of water are collected. What is the empirical formula of the compound?

1. C_6H_4N
2. CH_5N_2
3. CH_5N
4. C_4HN_2

Table 3.2 Information Conveyed by the Balanced Equation for the Combustion of Methane

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Reactants		Products
$CH_4(g) + 2O_2(g)$	$\longrightarrow$	$CO_2(g) + 2H_2O(g)$
1 molecule + 2 molecules	$\longrightarrow$	1 molecule + 2 molecules
1 mole + 2 moles	$\longrightarrow$	1 mole + 2 moles
6.022×10^{23} molecules + 2 (6.022×10^{23} molecules)	$\longrightarrow$	6.022×10^{23} molecules + 2 (6.022×10^{23} molecules)
16 g + 2 (32 g)		44 g + 2 (18 g)
80 g reactants	$\longrightarrow$	80 g products